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PRODUCTION ENGINEERING MEASURE FOR MANUFACTURE OF METEOROLOGICAL BALLOONS TYPE ML-541( )/UM

FOURTH QUARTERLY PROGRESS REPORT

19 January 1963 - 18 April 1963

Contract No. DA-36-039-SC-85988

Order No. 19038-PP-62-81-81

Placed by
U. S. Army Signal Supply Agency
225 South 18th Street
Philadelphia 3, Pennsylvania

Kaysam Corporation of America
27 Kentucky Avenue
Paterson 3, New Jersey

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19 January 1963 - 18 April 1963

The object of this contract is to establish the capability of producing ML-541( ) /UM meteorological balloons on a pilot-line basis.

Signal Corps Contract No.: DA-36-039-SC-85988

Signal Corps Specification No.: SCIPPR No. 15 dated 1 October 58

Prepared by: Murray Miner

Edited by: John Kantor

KAYSAM CORPORATION OF AMERICA
27 Kentucky Avenue
Paterson 3, New Jersey

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PURPOSE

The prime technical objective of this Production Engineering Measure is to establish the capability of producing the ML-541( )/UM balloon on a pilot-run basis. This objective implies the attainment of improved quality of balloon and the achievement of uniformity in the finished balloon and its performance in flight.

A second objective is the development of manufacturing methods to a high level of technology. This provides for the utilization of automatic and semi-automatic equipment whenever possible, taking into consideration that the balloon is a delicate device to handle.

A goal in the design of the equipment is to anticipate technological development of meteorological balloons, and to design all equipment in such a manner that the danger of early obsolescence is practically nil.

A further objective is to prepare a mobilization plan for production of the ML-541 ( ) /UM balloon at the specified production rate.

From an economic point of view, the goal of the development of improved methods of manufacture under this Production Engineering Measure is the reduction in cost and price of this balloon.

Also, insofar as existing facilities can be used to establish the production capability, it will be an objective to limit the funds required for equipment to a minimum, consistent with the attainment of pilot-run goals.

ABSTRACT

Automatic Dipping Machine

The cross-bar dipping conveyor concept has been abandoned in favor of a one-cylinder turntable. Careful analysis indicates that the one-cylinder turntable has advantages of economy, simplicity, and safety.

The major portion of the head-balloon dipping machine is now specified. Several components have already been received. The basic functions of the various components of the dipping machine have been described.

NARRATIVE AND DATA

Automatic Dipping Machine

The design of the cross-bar dipping conveyor was close to its completion when it was subjected to careful scrutiny. A detailed analysis disclosed several undesirable features which were not apparent initially.

In view of the large, unbalanced loads conveyed high above the working floor, all racks, superstructure, and chain were meticulously examined to insure complete operational safety. This insurance required a highly elaborate design to eliminate the possibility of danger to personnel working below.

Approximately eighty (80) sprockets, each capable of withstanding an 8000-pound load, were required as were special heavy duty roller bearings pressed into the sprockets and subjected to severe cantilevered forces. Assembly, installation, and maintenance of these sprockets would be cumbersome and expensive.

Since the forms entered the tanks by travelling around a sprocket, widening of the tanks to provide sufficient clearance would require 40% additional neoprene.

These considerations prompted a re-evaluation of the entire dipping machine with the result that the cross-bar dipping conveyor has been abandoned in favor of a one-cylinder turntable. Because of its simplicity, the latter surpasses all other methods which have been investigated.

Basically, the dipping machine will be composed of a hydraulic cylinder with 6 equally spaced horizontal spokes. Two machines of this type will be installed; one machine will produce head balloons, the other tail balloons. Since a 30-minute cycle is required for the head balloon and a 20-minute cycle for the tail balloon, six head-balloon dipping forms and four tail-balloon dipping forms must be attached to each spoke, respectively, in order to satisfy the requirement for 75 balloons per 8-hour shift.

The production cycle consists of the following six stations: coagulant dwell, drip, neoprene dwell, gel hardening, strip, and shower.

The dipping operation comprises lowering the balloon forms into the various tanks, dwelling for as long as 30 minutes, raising the forms out of the tanks, and indexing the spokes 60 degrees. Raising and lowering is accomplished by a 10 5/8-inch-diameter hydraulic piston. Indexing is performed only when the piston is in the upper position, thereby clearing the tops of the tanks. The indexing mechanism is a hydraulically-operated rotary device designed to impart large torques to the hydraulic cylinder.

The neoprene tank is partitioned, water jacketed, and capable of circulation. Provision is made for a partition to divide the tank approximately in half, thus enabling working off the large residue remaining near the end of a production run. The partition consists of a flat plate reinforced with angle iron and bolted to an angle-iron frame which is welded to the sides and bottom of the tank.

Refrigerated water flows through the water jacket to maintain the neoprene at a low temperature. The water jacket surrounds the tank on three sides and consists of a 3-inch hollow space reinforced with rods to prevent buckling. Pipe couplings are welded to the water jacket for connection to the refrigerated water supply and to function as clean-out ports.

Circulation is effected by an impeller which pushes the neoprene through various baffles to maintain continuous motion on the surface of the liquid. The baffles are adjustable for varying liquid levels. A plastic mesh screen removes air bubbles, dirt, and solids from the solution.

The tank, together with its liquid contents, is supported above the floor by a heavy structural channel platform. The elevated tank permits drainage from the bottom so the tank may be completely emptied with a minimum of effort. A pipe nipple is welded to the side of the tank below the liquid level so that neoprene may be replenished without introducing air bubbles into the tank.

Provision is made for removal of the impeller from a full tank for inspection and cleaning as necessary. Long, threaded rods are attached to a horizontal baffle plate near the tank bottom. This baffle plate is raised together with the impeller assembly.

The coagulant tank is similar to the neoprene tank. In place of a 3-inch, hollow water jacket, 3-inch rock wool insulation is provided. The partition is unnecessary since the coagulant materials are inexpensive. A stainless-steel immersion heater heats the coagulant to the desired temperature. All other components are identical to the neoprene tank.

A drip station is provided after the balloon emerges from the coagulant tank. The balloon form is permitted to drip into a drain pan during the cycle, thus guarding against contamination of the neoprene tank by the dripping coagulant.

The gel-hardening tank is a simple, rectangular tank mounted on a heavy structural channel platform. A bottom drain is provided to facilitate cleaning. A lightnin mixer, fastened to the side of the tank, prevents settling of solids to the bottom.

At the strip station, the operator stands on an elevated, wood platform. Low-pressure air is supplied through a flexible hose for peeling the balloon gel from the balloon form.

The elevated platform will extend to the balloon drying area. As the operator attaches and removes balloons from the drying conveyor, the long, deflated balloons will hang below the platform level.

The uppermost portion of the spoked assembly, when extended fully, will rise approximately 20 feet above the floor level. Since the ceiling is 30 feet high, there is ample clearance.

The shower station is composed of a sheet-metal enclosure and numerous shower heads strategically placed to completely wash the balloon forms. The enclosure is provided with a bottom drain and a side door to facilitate maintenance. The balloon forms are washed immediately after the gels have been stripped from them.

Most of the design of the head-balloon dipping machine has been completed. All tanks, hydraulic cylinders, and rotary devices have been specified. Bids are being received on tanks, and the hydraulic cylinder has already been procured.

The new building addition which will house the PEM equipment for the manufacture of the ML-541 balloon is almost complete. The various utilities necessary for operation of the equipment are in the process of being specified.

CONCLUSIONS

Automatic Dipping Machine

All components of the dipping machine lend themselves to an integrated automatic machine. Stripping of the balloon gel from the form is the only manual operation.

The decision to abandon the cross-bar dipping conveyor in favor of the one-cylinder turntable has resulted in a 40% saving of neoprene. Savings will also be realized on the various tanks because of their smaller size.

PROGRAM FOR THE NEXT INTERVAL

Automatic Dipping Machine

It is anticipated that the head-balloon dipping machine will be made operational during the next interval. All utilities, as well as completely automated electrical controls, will be installed.

Design of the balloon drying conveyor will commence during this period.

Balloon Assembly Machine

It is planned to begin the design of the balloon assembly machine during the next interval.

Special Tooling

During this interval 12 head-balloon dipping forms and 12 tail-balloon dipping forms will be procured from which 28 ML-541 pre-production samples will be produced.

PUBLICATIONS AND REPORTS

During the period covered by this progress report, no publications or special reports were made on or associated with the research, study, or development under contract.

IDENTIFICATION OF PERSONNEL

Name	Number of Hours
John Kantor	40
Eric Nelson	-
Curt Toepert	-
Murray Miner	415
Harding Wing	-

PRODUCTION ENGINEERING MEASURE

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